CLAIMS

What is claimed is:

1. A method for detecting molecules, molecular interactions or molecular complexes comprising:

(a) detecting, through interaction with at least one probe, an interaction between the probe and a molecule, wherein at least one probe has a differentiating physical characteristic selected from the group consisting of a net charge, a mass, and any combination thereof, and at least one probe has a detectable parameter; and

(b) differentiating between an unbound probe or probes of (a) and a probe or probes bound to the molecule.

2. A method according to claim 1, wherein the at least one probe interacts with a feature of the molecule selected from the group consisting of a site on a target molecule species, a probe attached to the molecule, and any combination thereof.

3. A method according to claim 1, wherein the differentiating physical characteristic between the probe and molecule is differentiable from one or more of the other probes, when two or more probes interact with the molecule.

4. A method according to claim 1, wherein the differentiation of the probe is based upon the behavior of both the unbound CM probe and the bound CM probe target complex, or the behavior of either the unbound CM probe or the bound CM probe-target complex by virtue of the detected entity's or entities' behavior in an electric field.

5. A method according to claim 1, wherein one or more of the detectable probes also is a CM probe

6. A method according to claim 1, wherein either the target or the CM probe-target complex is a detectable.

7. A method according to claim 1, wherein both the target and the CM probe-target complex are detectable.

8. A method according to claim 1, wherein the probe or probes is selected from among a nucleic acid, oligonucleotide, PNA, LNA, XLNT, peptide, polypeptide, lipid, sterol, biological molecule, dye, drug, small molecule, mass tag, isotope, microsphere, nanosphere, barcode particle, or nanocrystal, and any combination thereof.

9. A method according to claim 1, wherein at least one of the detectable parameters is chosen from among luminescence, chemiluminescence, light absorption, light scattering, fluorescence, fluorescence lifetime, fluorescence polarization, emission burst size, emission burst length, emission wavelength, emission intensity, electrical reactance, enzyme activity, diffusion, cooperative hybridization, EPR, SER, SPR, raman emission, microwave, electrophoretic velocity, electrokinetic velocity and other luminescent or non- luminescent-related parameters known to those experienced in the art.

10. A method according to claim 1, wherein at least one of the probes is labeled with one or more dye molecules

11. A method according to claim 1, wherein the detectable parameter is measured by optical or electrical detection

12. A method according to claim 11, wherein two or more detectors are used

13. A method according to claim 11, wherein one or more detectors are chosen from among avalanche photodiodes, and a CCD camera

14. A method according to claim 13, wherein the CCD camera serves to detect two or more parameters

15. A method according to claim 13, wherein the CCD camera detects one or more parameters from two or more positions within the sample

16. A method according to claim 1, wherein detection uses spatial or temporal measurements for detection

17. A method according to claim 1, wherein two or more nucleic acid probes are used

18. A method according to claim 17, wherein one or more of the probes contains one or more CM tags

19. A method according to claim 17, wherein one or more of the probes is labeled with fluorescent dye molecules

20. A method according to claim 19, wherein the probe and probe complexes are detected at more than one detector.

21. A method according to claim 20, wherein the data from two of more detectors is cross-correlated

22. A method according to claim 20, wherein two or more of the detectors are spatially separated.

23. A method according to claim 22, wherein correlated parameter data is used to determine electrophoretic velocities of detected entities.

24. A method according to claim 23, wherein electrophoretic velocity is one of the parameters used to differentiate between molecular species.

25. A method according to claim 23, wherein fluorescence measurements are used to detect the target, one or more probes, and/or the complex formed as a result of interaction of the target with one or more probes.

26. A method according to claim 1, wherein multiple targets are detected in a single assay.

27. A method according to claim 1, wherein unbound probes are removed from the sample prior to analysis

28. A method according to claim 1, wherein unbound probes are made undetectable prior to analysis.

29. A method according to claim 27, wherein one or more probes is released from the probe-target complex after specific interaction of the target with one or more probes.

30. A method according to claim 29, wherein the released probes are detected and serve as a measure of the number of probe-target complexes present.

31. A method according to claim 27, wherein probes remaining on the target are detected and these serve as a measure of the target present.

32. A method according to claim 1, wherein one or more of the probes is bound to a surface

33. A method according to claim 1, wherein one or more of the probes is bound to a particle.

34. A method according to claim 1, wherein the sample is in solution.

35. A method according to claim 1, wherein the sample also contains a sieving matrix

36. A method for detecting and molecules, molecular interactions or molecular complexes, consisting of:

a. One or more probes

b. Each probe recognizing (via hybridization, binding, etc.) at least one target molecule species, or site on a target molecule species (or another probe), and

c. At least one of the probes has a net charge, mass or net charge and mass (any or the three or which is designated as a CM tag) that is differentiable from the target or from one or more of the other probes, and

d. At least one probe or target that has a detectable parameter

e. Differentiating between an unbound CM probe and a probe bound to a target (complex, forming an interaction, or to another probe) based upon a temporal difference in detection between the unbound CM probe and the bound CM probe target complex in an electric field, or

f. Differentiating CM probe based upon a temporal difference in detection of either the unbound CM probe or the bound CM probe-target complex by virtue of temporal difference in detection between the detected entity's or entities' behavior in an electric field.

37. The method of claim 36 where one or more of the detectable probes also is a CM probe

38. The method of claim 36 where either the target or the CM probe-target complex is a detectable.

39. The method of claim 36 where both the target and the CM probe-target complex are detectable.

40. The method of claim 36 where the probe or probes is selected from among a nucleic acid, oligonucleotide, PNA, LNA, XLNT, peptide, polypeptide, lipid, sterol, biological molecule, dye, drug, small molecule, mass tag, isotope, microsphere, nanosphere, barcode particle, or nanocrystal, and any combination thereof.

41. The method of claim 36 where at least one of the detectable parameters is chosen from among luminescence, chemiluminescence, light absorption, light scattering,

fluorescence, fluorescence lifetime, fluorescence polarization, emission burst size, emission burst length, emission wavelength, emission intensity, electrical reactance, enzyme activity, diffusion, cooperative hybridization, EPR, SER, SPR, raman emission, microwave, electrophoretic velocity, electrokinetic velocity and other luminescent or non- luminescent-related parameters known to those experienced in the art.

42. The method of claim 33 where at least one of the probes is labeled with one or more dye molecules

43. The method of claim 33 where the detectable parameter is measured by optical or electrical detection

41. The method of claim 40 where two or more detectors are used

42. The method of claim 40 where one or more detectors are chosen from among avalanche photodiodes, and a CCD camera

43. The method of claim 42 where the CCD camera serves to detect two or more parameters

44. The method of claim 42 where the CCD camera detects one or more parameters from two or more positions within the sample

45. The method of claim 33 where detection uses spatial or temporal measurements for detection

46. The method of claim 33 where two or more nucleic acid probes are used

47. The method of claim 46 where one or more of the probes contains one or more CM tags

48. The method of claim 46 where one or more of the probes is labeled with fluorescent dye molecules

49. The method of claim 16 where the probe and probe complexes are detected at more than one detector.

50. The method of claim 49 where the data from two of more detectors is cross-correlated

51. The method of claim 49 where two or more of the detectors are spatially separated.

52. The method of claim 51 where correlated parameter data is used to determine electrophoretic velocities of detected entities.

53. The method of claim 52 where electrophoretic velocity is one of the parameters used to differentiate between molecular species.

54. The method of claim 52 where fluorescence measurements are used to detect the target, one or more probes, and/or the complex formed as a result of interaction of the target with one or more probes.

55. The method of claim 33 where multiple targets are detected in a single assay.

56. The method of claim 33 where unbound probes are removed from the sample prior to analysis

57. The method of claim 33 where unbound probes are made undetectable prior to analysis.

58. The method of claim 57 where one or more probes is released from the probe-target complex after specific interaction of the target with one or more probes.

59. The method of claim 57 where the released probes are detected and serve as a measure of the number of probe-target complexes present.

60. The method of claim 58 where probes remaining on the target are detected and these serve as a measure of the target present.

61. The method of claim 33 where one or more of the probes is bound to a surface

62. The method of claim 33 where one or more of the probes is bound to a particle.

63. The method of claim 33 where the sample is in solution.

64. The method of claim 33 where the sample also contains a sieving matrix